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NAVWEPS 17-20AY-10
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Technical Manual

Instrument Calibration Procedure

AY-10

MICROWAVE CRYSTAL TEST SET
AIRBORNE INSTRUMENTS LABORATORY
TYPE
390-1 • 390-A2 • 390-A3

DEPARTMENT OF THE NAVY
BUWEPS-BUSHIPS CALIBRATION PROGRAM

Prepared By
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THE CHIEF OF THE BUREAU OF NAVAL WEAPONS

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PREFACE

This procedure has been prepared specifically for those laboratories participating in the Navy Calibration Program. The government assumes no responsibility for its use by other agencies.

The instruments utilized in this procedure were selected from those known to be at the disposal of the participating laboratories, and the listing by make and model number carries no implication of preference, recommendation, or approval by the Navy for use by other agencies. It is recognized that equivalent equipment produced by other manufacturers may be capable of equally satisfactory performance in the procedure.

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1. INTRODUCTION

1.1 This procedure describes the calibration of the type 390-1, 390A-2, or 390A-3 microwave crystal test set, which is a portable battery-powered instrument designed to measure the relative noise figure of microwave mixer crystals. The type 390A-3 microwave crystal test set may also be used to match crystals for use in balanced mixers, and to measure the relative sensitivity of microwave detector crystals. The instrument being calibrated will be referred to herein as the Test Instrument.

1.2 The Test Instrument consists of a 200 μa meter, a 1.5 volt battery, and two voltage dividers.

1.3 Each Test Instrument function is tested to verify its correct performance within the required tolerances, as follows:

1.3.1 The Test Instrument panel meter is tested by checking the meter at each major-scale division. The test is performed by adjusting the variable control to obtain each major-scale division, and recording each corresponding indication from an external milliammeter connected in series with the Test Instrument.

1.3.2 The Test Instrument voltage divider is tested by establishing a voltage reference on the meter (the desired voltage reference is established when the meter indication equals the variable control indication), and switching in the voltage divider and recording the resulting meter indication.

1.4 All measurement data must be recorded on the calibration checklist, a sample of which is included in this procedure. Tests performed to verify Test Instrument operating characteristics should be noted on the checklist by placing checks in the spaces provided.

1.5 The estimated time for a routine calibration of the Test Instrument, excluding repair, maintenance, and unusual adjustment, is:

Setup time	0.1 hr
Calibration time	0.2
Total	0.3 hr

2. EQUIPMENT REQUIRED (OR EQUIVALENT)

NOTE

All instruments used during this calibration must bear current calibration servicing identification labels.

	Substitute Equipment
2.1 Decade resistor: GR 1432-N or Gray E-1044 MB	_____
2.2 Milliammeter: Greibach 500, 1 μa to 1 amp Only the 0.3 and 0.1 milliampere ranges are used in this procedure, or any ammeter capable of indicating currents from 30 to 225 μa with an accuracy of ±0.75% or better.	_____ _____

Substitute Equipment

2.3 Shielded phone plug: two conductor, standard size _____

2.4 Interconnecting leads as required _____

3. METER LINEARITY AND VOLTAGE DIVIDER TESTS

3.1 TEST CONFIGURATION

3.1.1 Connect all the applicable equipment as shown in figure 1.

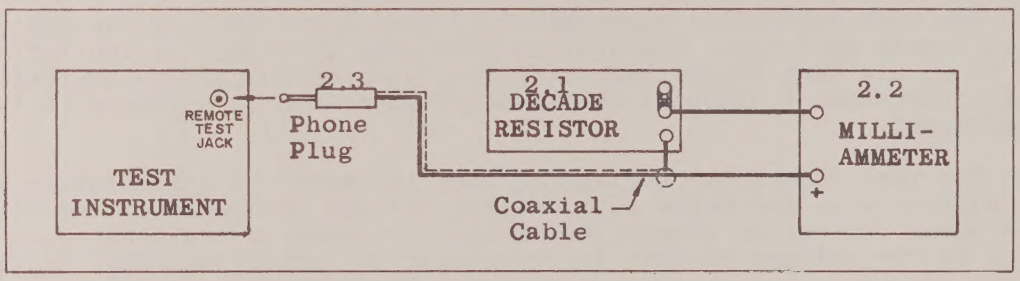

Figure 1. Meter Linearity and Voltage Divider Test Connections

3.2 METER ACCURACY AND LINEARITY TEST

3.2.1 If necessary, adjust the Test Instrument and milliammeter mechanical zeros to zero the meters.

3.2.2 Set the decade resistor switches to obtain 1000Ω.

3.2.3 Set the milliammeter range switch to .3.

3.2.4 Set the Test Instrument variable control to 100.

3.2.5 Hold the Test Instrument CAL-TEST switch in the CAL position, adjust the variable control to obtain meter indications of 100, 80, and 60, and record each of the resulting milliammeter indications. Release the CAL-TEST switch.

3.2.6 Set the decade resistor switches to obtain 2500Ω, the milliammeter range switch to .1, and repeat step 3.2.5 for meter indications of 40 and 20.

3.3 VOLTAGE DIVIDER TEST

3.3.1 Adjust the Test Instrument variable control to exactly 100.

3.3.2 Set the milliammeter range switch to .3.

3.3.3 Hold the CAL-TEST switch to the CAL position, and adjust the decade resistor switches to obtain an indication of 200 on the milliammeter.

3.3.4 Hold the CAL-TEST switch to the TEST position, and record the milliammeter indication. Verify that the Test Instrument meter is indicating approximately 50, and release the CAL-TEST switch.

4. TEST INSTRUMENT EVALUATION

4.1 Complete the calibration checklist, and verify that the Test Instrument is in acceptable condition. If not, take the required corrective action in accordance with the instruction manual and local laboratory practices, and repeat the applicable portions of this procedure.

4.2 Unless other measurements are to be performed, disconnect the Test Instrument.

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NAVY CALIBRATION CHECKLIST
IIND-BWR-5512/9 (5-62)

SECTION A

1. CALIBRATING ACTIVITY
2. SUBMITTING ACTIVITY
3. TEST INSTRUMENT *(Name of Item Calibrated)* — Crystal Test Set
4. MANUFACTURER — AIB
5. MODEL NUMBER *(Commercial or Military)* — 390A-2
6. SERIAL NUMBER
7. REASON FOR SUBMISSION
   - CERTIFICATION/CALIBRATION [X] 1
   - CROSSCHECK [ ] 2
   - FAILURE FROM DAMAGE OR ABUSE [ ] 3
   - OPERATIONAL FAILURE [ ] 4
8. DATE OF LAST SERVICING
9. SERVICING CYCLE (MONTHS)
   - CERTIFICATION/CALIBRATION
   - CROSSCHECK
10. CALIBRATION PROCEDURE — AY-10

SECTION B

1. CALIBRATION TECHNICIAN
2. TEST DATE
3. CONDITION RECEIVED
   - WITHIN TOLERANCE [ ] 1
   - OUTSIDE TOLERANCE *Explain Below in 'REMARKS'* [ ] 2
4. CONDITION RETURNED
   - WITHIN TOLERANCE [ ] 1
   - OUTSIDE TOLERANCE *Explain Below in 'REMARKS'* [ ] 2
5. CERTIFICATED OR REPORTED VALUE, IF FIXED STANDARD
6. MAN-HOURS TO CALIBRATE
7. MAN-HOURS TO REPAIR *(List Repairs in 'REMARKS')*
8. SERVICING LABEL AFFIXED
   - CERTIFICATION/CALIBRATION [ ] 1
   - CROSSCHECK [ ] 2
   - LIMITED USE [ ] 3 *(Explain Below in 'REMARKS')*
   - REJECT [ ] 4 *(Explain Below in 'REMARKS')*
9. NEXT SERVICING DATE
   - CERTIFICATION/CALIBRATION
   - CROSSCHECK

SECTION C

REMARKS

Typical Calibration Checklist

[ ] REPLY TO REMARKS REQUESTED

APPROVED _____
LABORATORY SUPERVISOR

NOTE: GENERAL INSTRUCTIONS FOR COMPLETING THIS CHECKLIST ARE PROVIDED IN *BUWEPSREP POMONA INST 4355.2*

NAVY CALIBRATION CHECKLIST
11ND-BWR-5512/9 (5-62) (Back)

SECTION D

TEST INST(S): AIB 390-1, 390A-2, or 390A-3

PROC. NO. AY-10 MFR MODEL SER.NO.

PROCEDURE STEP NO. (1)	FUNCTION TESTED (2)	NOMINAL (3)	MEASURED VALUES FIRST RUN (4)	MEASURED VALUES SECOND RUN (5)	OUT OF TOL ✓ (6)	CALIBRATION TOLERANCES (7)
3.2	Meter Accuracy and Linearity Test					
3.2.5	100	200 µa				194 to 206 µa
"	80	160 "				154 to 166 "
"	60	120 "				114 to 126 "
3.2.6	40	80 "				74 to 86 "
"	20	40 "				34 to 46 "
3.3	Voltage Divider Test					
3.3.4	Milliammeter	100 µa				97 to 103 µa
3.3.4	Test Inst. Meter		ck ( )			